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Detection of line-profile variations in high-resolution VLT/UVES spectroscopy of the subdwarf B pulsator PG 1336−018 (NY Virginis)

M. Vučković[1], R. Østensen[1], J.H. Telting[3], R. Oreiro[1], and C. Aerts[1,2]

[1] Instituut voor Sterrenkunde, Leuven, Belgium
[2] Department of Astrophysics, Nijmegen, The Netherlands
[3] Nordic Optical Telescope,Santa Cruz de La Palma, Spain

Abstract

We present an analysis of about 400 high-resolution time-resolved VLT/UVES spectra of the eclipsing subdwarf binary system PG 1336−018 - a rapidly pulsating subdwarf B primary in a short orbit with an M5 companion. We analysed the spectra of PG 1336−018 with the aim to detect the pulsational signal of the primary in line-profile variations. After removing the dominant radial-velocity component inherent to the orbital motion, we computed cross-correlation functions for each individual spectrum and assumed these to approximate the average line profile. The dominant pulsation mode is detected in the cross-correlation functions and may lead to the first spectroscopic mode identification for this star.

Individual Objects: PG 1336-018

Frequency detection

We have calculated the Fourier amplitude spectrum of the time series of the cross-correlation profiles. For each wavelength (velocity) bin, the amplitude as a function of frequency is plotted in Fig. 1. In the frequency domain where the most pulsation power of PG 1336−018 is detected in photometry (Kilkenny et al.2003) we find a frequency at which variations are clearly seen. This frequency at 5435 μHz is the main pulsation mode seen in the ULTRACAM data set (Vučković et al. 2007) and is found in all photometric data sets on PG 1336−018 (Kilkenny et al. 1998, 2003; Reed et al. 2000). This is the first time that variation in the line profiles of PG 1336−018 has been detected. Our aim, like in any asteroseismic study, is to identify the modes of the pulsation. Such a study is currently under way. In the follow-up paper of this work, we will present the analysis of the character of this mode.

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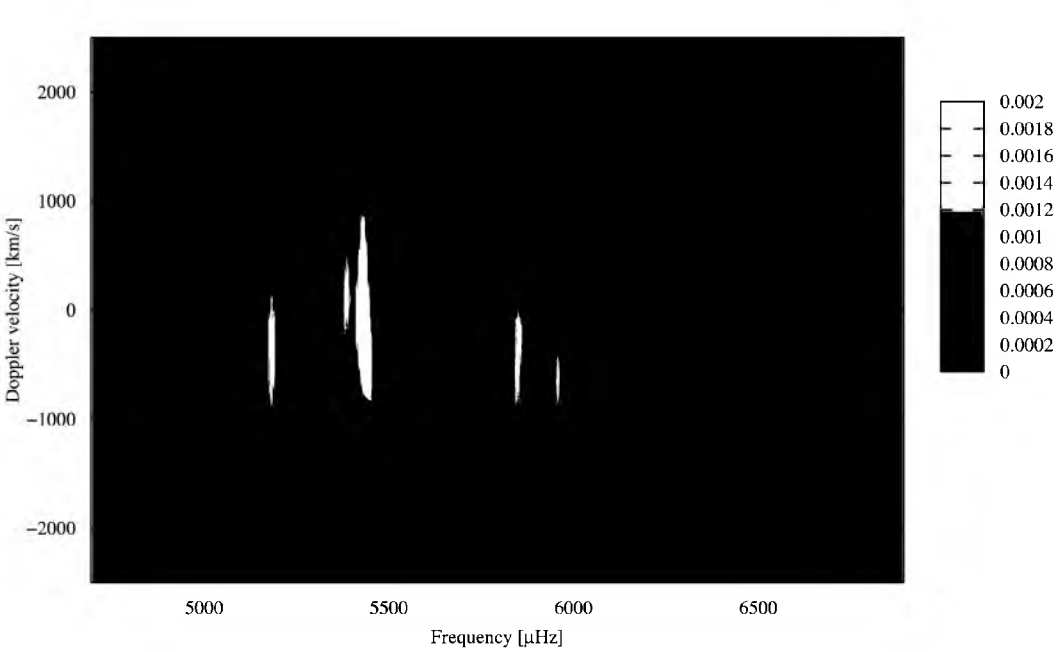

Figure 1: Two dimensional Fourier amplitude spectrum of all the out-of-eclipse PG 1336−018 spectra.

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